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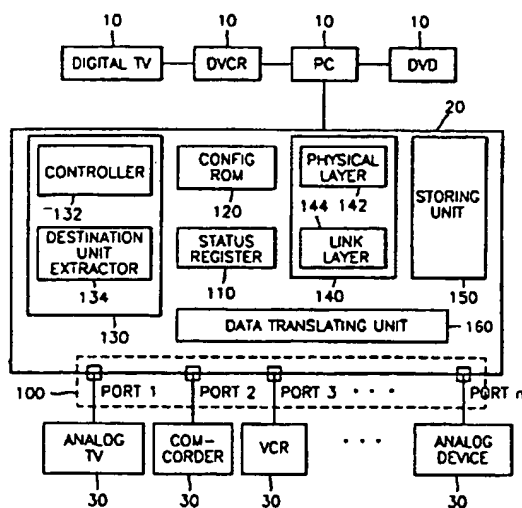
Online: wpi epodoc japlo

(54) Abstract Title

**Analogue translator for IEEE 1394 bus**

(57) An analogue translator for the IEEE 1394 serial bus including a plurality of ports 100 to which analogue devices 30 are connected and a controller 132 for setting corresponding bits of a status register 110 assigned to a device, reading the bit status of the set status register 110, and recording connection information to a configuration ROM 120. A 1394 interfacing unit 140 is included for receiving a packet data from the IEEE 1394 bus, checking whether the packet corresponds to a node thereof and disintegrating the packet data and thus removing a header from the packet data, a storing unit 150 stores payload data removed from a header from the 1394 interface and a destination extractor 134 decodes the payload data and extracts information on the destination device of the payload data and a translating unit 160 translates the payload data removed from the information on the destination device onto an analogue signal.

FIG. 1



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FIG. 1

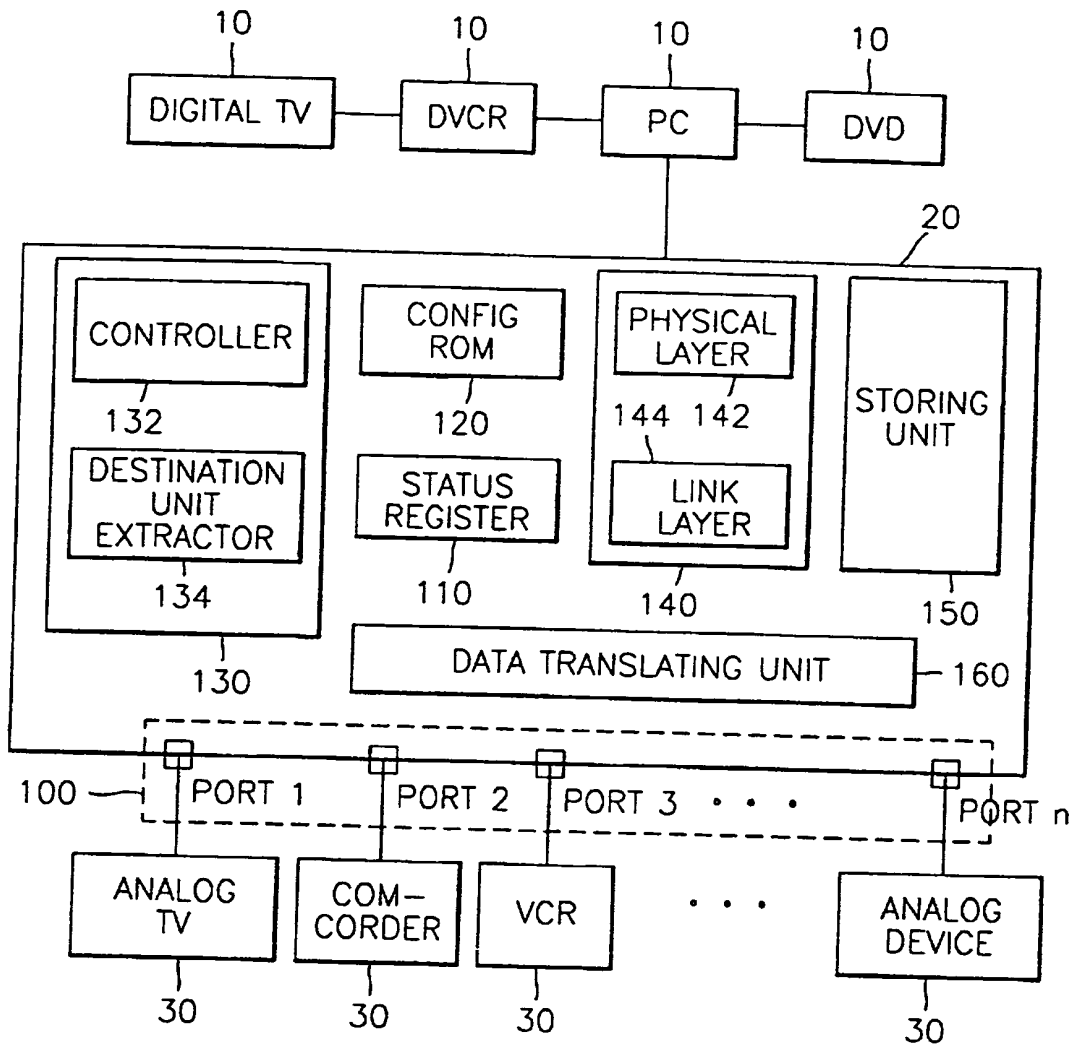


FIG. 2

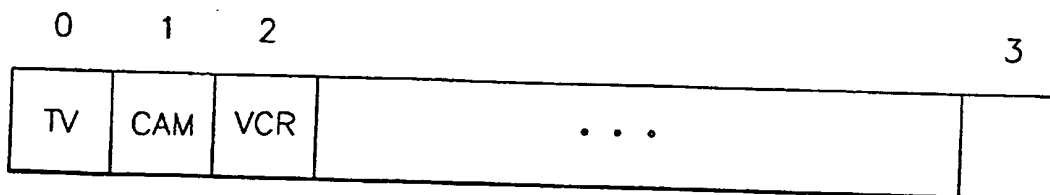
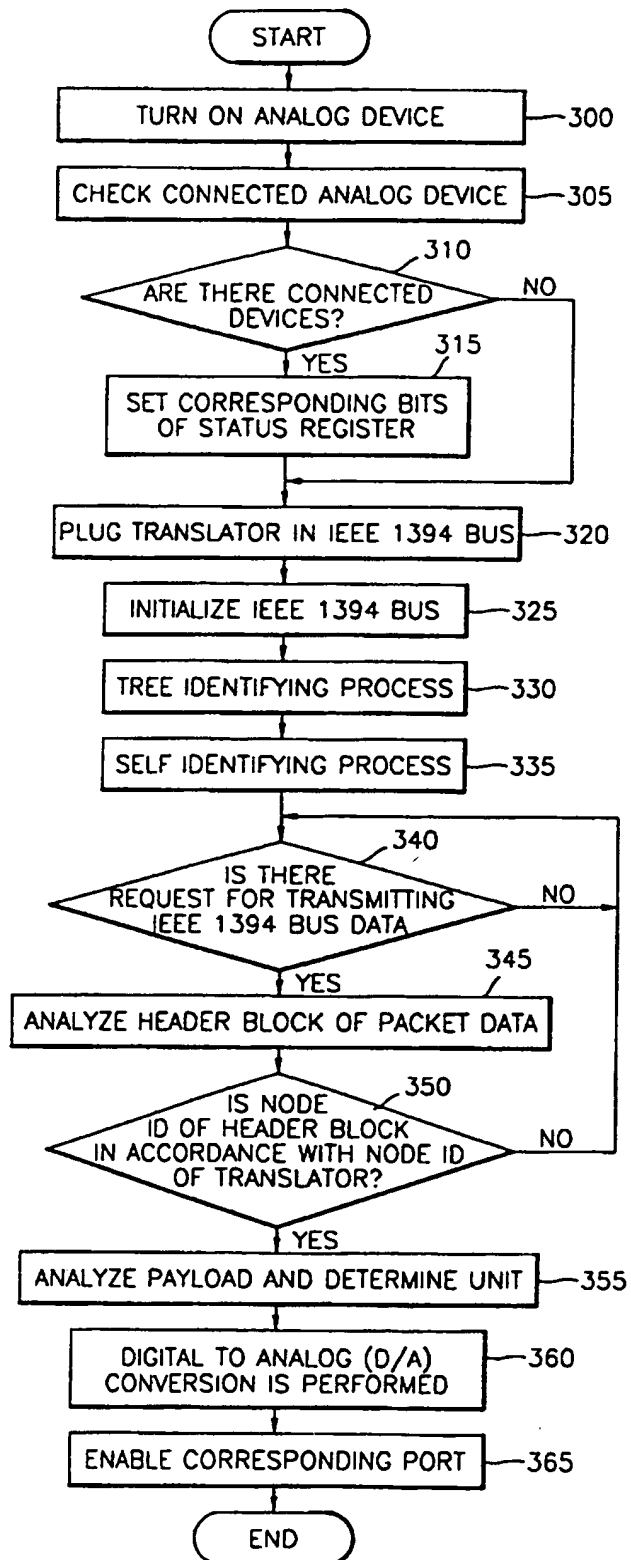


FIG. 3



ANALOGUE TRANSLATOR FOR IEEE 1394 AND  
TRANSLATING METHOD THEREOF

5       The present invention relates to IEEE 1394 data  
translation, and more particularly, to an analogue  
translator for the IEEE 1394 by which it is possible to  
use analogue devices in a state where the analogue devices  
are connected to the IEEE 1394 bus and a translating  
10 method thereof.

      Recently, various digital devices such as digital TVs  
(DTVs), digital video cameras (DVCs), digital video disk  
players (DVDPs), and digital set-top boxes have appeared.  
15 The IEEE 1394 serial bus is spotlighted as an interface  
for the above devices. For interfacing a device with the  
IEEE 1394 bus, the device should be a digital device.  
However, almost all audio/video devices currently used in  
the home are analogue devices, thus being incompatible  
20 with the IEEE 1394 serial bus which is highlighted as the  
base of home networks. Therefore, such analogue  
audio/video devices must be replaced by digital  
audio/video devices for the IEEE 1394. An analogue  
translator for the IEEE 1394 is required to interface the  
25 analogue audio/video devices with the IEEE 1394 bus.

      With a view to solve or reduce the above problem, it  
is an aim of embodiments of the present invention to  
provide an analogue translator for the IEEE 1394 for  
30 interfacing analogue devices such as TVs, camcorders, and  
VCRs with the IEEE 1394 based on a digital interface in  
order to allow the analogue devices to operate as a part  
of home networks.

It is another aim of embodiments of the present invention to provide an analogue translating method for the IEEE 1394.

5       According, to a first aspect of the invention, there is provided an analogue translator for the IEEE 1394 serial bus, comprising: a plurality of ports to which analogue devices are connected; a status register for showing which analogue devices are connected; a  
10 configuration ROM for storing the information on the connected analogue devices; a controller for setting the corresponding bit of a status register assigned to an analogue device, reading the bit status of the set status register, and recording connection information of the  
15 analogue device to the configuration ROM which refer to the bit status of the status register, when an analogue device is connected to the port; a 1394 interfacing unit for receiving a packet data from the IEEE 1394 bus, checking whether the packet data corresponds to the node  
20 thereof, and disintegrating packet data and thus removing a header from the packet data when the packet data corresponds to the node thereof; a storing unit for storing payload data removed of a header from the 1394 interface; a destination unit extractor for decoding the  
25 payload data of the storing unit and extracting information on the destination analogue device of the payload data; and a data translating unit for translating the payload data removed of the information on the destination analogue device into analogue signal.

30

Preferably, the 1394 interfacing unit comprises: a physical layer for receiving a packet data from the IEEE

1394 bus; and a link layer for checking whether the received packet data is the data corresponding to the node thereof and disintegrating the packet data, removing a header from the packet data, and detecting error when the  
5 received packet data is the data corresponding to the node thereof.

Preferably, an analogue translating method for the IEEE 1394, comprises the steps of: (a) checking which  
10 analogue devices are connected; (b) recording information on the connected analogue devices; (c) initializing the IEEE 1394 bus after plugging a translator in the IEEE 1394 bus; (d) determining whether a request to transmit 1394 bus data exists; (e) analyzing a packet header of packet  
15 data when a request to transmit data is received and checking whether the packet data is the data corresponding to the node connected to the translator; (f) extracting a destination unit by analyzing the payload data; (g) translating pure payload data removed of the unit  
20 information; and (h) transmitting the translated payload data to the extracted destination unit.

Preferably, the step (a) comprises the steps of: (a) setting a corresponding bit of the status register  
25 assigned to a port to which the analogue device is connected, when an analogue device is connected; and reading the bit status of the status register, identifying the connected analogue device with reference to a configuration ROM where connectable analogue devices are  
30 mapped to the port numbers, and recording a connection status.

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

5

Figure 1 shows the structure of an IEEE 1394 network including a translator according to an embodiment of the present invention;

10      Figure 2 shows an example of a status register; and

Figure 3 is a flowchart showing the operation of the IEEE 1394 translator according to an embodiment of the present invention.

15

Figure 1 shows the structure of the IEEE 1394 network including a translator according to a preferred embodiment of the present invention. The IEEE 1394 network consists of nodes 10 connected by the IEEE 1394 bus, a translator  
20 20, and analogue devices 30 connected to the translator.

The translator 20 connected to the analogue devices 30 receives transmitted data from the nodes 10 through the IEEE 1394 bus, translates the transmitted data into an  
25 analogue signal, and sends the analogue signal to a corresponding analogue device.

The translator 20 is comprised of a plurality of ports 100, a status register 110, a configuration ROM 120, a  
30 microcomputer 130, a 1394 interfacing unit 140, a storing unit 150, and a data translating unit 160.

The analogue devices 30 are connected to the plurality of ports 100.

In the status register 110, a plurality of bits show  
5 whether the analogue devices 30 are connected to the plurality of ports 100. Each bit of the status register is assigned to each analogue device. Therefore, when an analogue device is connected to a port, a corresponding bit is set. Figure 2 shows an example of a status  
10 register of 32 bits. Bits 0, 1, and 2 are respectively assigned to a TV set, a camcorder, and a VCR.

The configuration ROM 120 stores information on the names of the connected analogue devices and whether the  
15 analogue devices are connected. More preferably, information on the connection status of units and information on the respective units are stored in a root directory region and a unit directory region of configuration ROM 120 respectively. The root and unit  
20 directory regions are specified by a general ROM format in section 8 of the IEEE 1394 specification. The units correspond to analogue devices.

The microcomputer 130 consists of a controller 132 and  
25 a destination unit extractor 134. The controller 132 sets the corresponding bit of the status register 110 assigned to the analogue device, reads the set status register, and records information on the status of connection of the analogue devices on the configuration ROM 120. The  
30 destination unit extractor 134 decodes payload data stored in the storing unit 150 and extracts the destination analogue device of the payload data.

The 1394 interfacing unit 140 has a physical layer 142 and a link layer 144. The physical layer 142 receives data bit stream from the IEEE 1394 bus. The link layer 144 checks whether the received data bit stream  
5 corresponds to the node of the translator. When the received data bit stream corresponds to the node of the translator, the link layer 144 disintegrates the packet, removes the header, and detects errors.

10 The storing unit 150 stores payload data output from the 1394 interfacing unit 140. Preferably, the storing unit 150 adopts a first-in/first-out (FIFO) structure.

The data translating unit 160 translates pure payload  
15 data removed of the information on the destination analogue device into analogue data.

According to the IEEE 1394-1995 standard specification, all nodes on the IEEE 1394 bus undergo bus  
20 resetting and initialization processes and tree and self-identifying processes where the unique IDs of nodes are determined whenever devices are plugged in and detached from the nodes. A root node is determined in the tree identifying process and IDs of the respective nodes are  
25 dynamically determined in the self-identifying process. The root node and node IDs determined as above are upgraded whenever the bus is reset.

However, analogue devices do not have a plug & play  
30 function. Therefore, the translator must sense that an analogue device is connected to the port in order to identify which analogue devices are connected thereto. To do this, it is possible that when an analogue device is

connected to the port, the port number of the connected analogue device is set by an external button. In this case, the set port number and the analogue device must be previously mapped and fixed. For example, fixed mapping information between the port and the device such that the port 1 is connected to a TV set and that the port 2 is connected to a camcorder is stored in the configuration ROM 120. When an analogue device is connected to a port of the translator and the external button is turned on, a certain level of current flows thereto. Then, the current level is checked and the level value is stored in the status register 110. Then, the microcomputer 130 reads the level value, identifies which analogue device corresponds to the level value with reference to the configuration ROM 120, and records a status of connection. This is how the translator identifies which analogue devices are connected thereto.

A node which is to transmit data to the analogue device connected to the translator accesses the translator 20 and reads the configuration ROM 120. The translator operates as a node connected to the IEEE 1394 bus and is connected to a plurality of analogue devices. The analogue devices connected to the translator are designated as a unit. The information of the units is stored in a unit directory region. The node transmits data having formats suitable for the respective analogue devices based on the information of the units. The detailed structure of root and unit directories is the same as the structure specified by the IEEE 1212. Key values of the directory are not defined yet and are left to the user. Definitions of the key values of such a directory are dealt with in an upper software region. The

translator analyzes the transmitted data block, enables the corresponding path of a device specified in the data, and transmits data through the path.

5       The analogue device connected to the translator cannot perform an arbitration for requesting the transmission of data as does a node. The analogue device can only receive data transmitted from the IEEE 1394 node through the translator. The IEEE 1394 translator is connected to the  
10 IEEE 1394 bus after identifying the analogue device connected thereto. At this time, the IEEE 1394 translator can be a root node by resetting the IEEE 1394 bus. After the IEEE 1394 translator becomes the root node, the IEEE 1394 bus prevents the bus from being reset even though a  
15 new analogue device is added or removed, thus not prohibiting the data transmission of other devices. However, even in this case, the IEEE 1394 bus is reset when the translator is plugged in or detached from the IEEE 1394 bus.

20

Figure 3 is a flowchart showing the operation of the IEEE 1394 translator. A device to be connected is turned on (step 300) and the analogue device is manually connected to the translator. When the analogue device is  
25 connected, the translator examines the ports connected thereto and checks whether connected devices exist (step 305). If connected analogue devices exist (step 310), corresponding port values are stored by setting the corresponding bits of the status register (step 315). The  
30 connected device is identified with reference to the stored port value and the configuration ROM. Then, the translator is plugged in the IEEE 1394 bus (step 320). The IEEE 1394 bus is initialized by plugging in the

translator (step 325). The translator becomes a root node by Force\_Root command and thus can control the bus. The translator already has information on the analogue device connected thereto when the translator is plugged into the IEEE 1394 bus. When the translator becomes the root node, the translator gives a node ID through a tree identifying process (step 330) and gives node IDs to the respective nodes of the IEEE 1394 bus through the self-identifying process (step 335).

10

When an IEEE 1394 node intends to transmit data to the analogue device connected to the translator, the node reads the status register in the translator. The IEEE 1394 reads information on the port number from the configuration ROM using the bit status of the status register in order to identify which devices are connected and to determine to which device data is to be transmitted. Such information is stored in the root directory and the unit directory specified in the IEEE 1212 standard. When the packet is transmitted, the destination ID on the IEEE 1394 bus will be an ID of the root node. The translator checks whether there is a request to transmit data (step 340).

25 If there is request to transmit 1394 bus data, the translator analyzes the packet data (step 345) and checks whether the packet data corresponds to the node ID thereof (step 350). If the node ID of the header block is in accordance with the node ID of the translator, payload data obtained by removing a header from the packet data is stored in the storing unit 150. Then, the payload data is analyzed to determine to which analogue devices the data is to be transmitted (step 355). A digital-to-analogue

30

(D/A) conversion is performed to be suitable for the data format of the corresponding device (step 360). When the corresponding port is enabled, the data is transmitted to the analogue device (step 365).

5

According to embodiments of the present invention, after the translator is plugged into the IEEE 1394 serial bus, the bus is not reset no matter which IEEE 1394 device is added. Thus, the IEEE 1394 serial bus is not reset and  
10 the root node is not changed when a new device is added to or removed from the IEEE 1394 serial bus. Only the information of the added node is stored in the memory region and the ID is newly assigned to the information and is used.

15

According to embodiments of the present invention, it is possible to interface both analogue and digital devices in realizing the IEEE 1394 home network by the above-mentioned analogue to 1394 translator.

20

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this  
25 specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and  
30 drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

10 The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel  
15 combination, of the steps of any method or process so disclosed.

### Claims

1. An analogue translator for the IEEE 1394 serial bus,  
5 comprising:

a plurality of ports to which analogue devices are  
connected;

10 a status register for showing which analogue devices  
are connected;

a configuration ROM for storing the information on the  
connected analogue devices;

15 a controller for setting the corresponding bit of a  
status register assigned to an  
analogue device, reading the bit status of the set status  
register, and recording connection information of the  
20 analogue device to the configuration ROM which refer to  
the bit status of the status register, when an analogue  
device is connected to the port;

a 1394 interfacing unit for receiving a packet data  
25 from the IEEE 1394 bus, checking whether the packet data  
corresponds to the node thereof, and disintegrating packet  
data and thus removing a header from the packet data when  
the packet data corresponds to the node thereof;

30 a storing unit for storing payload data removed of a  
header from the 1394 interface;

a destination unit extractor for decoding the payload data of the storing unit and extracting information on the destination analogue device of the payload data; and

5 a data translating unit for translating the payload data removed of the information on the destination analogue device into analogue signal.

2. The translator of claim 1, wherein the 1394  
10 interfacing unit comprises:

a physical layer for receiving a packet data from the IEEE 1394 bus; and

15 a link layer for checking whether the received packet data is the data corresponding to the node thereof and disintegrating the packet data, removing a header from the packet data, and detecting error when the received packet data is the data corresponding to the node thereof.

20

3. An analogue translating method for the IEEE 1394, comprising the steps of:

(a) checking which analogue devices are connected;  
25

(b) recording information on the connected analogue devices;

(c) initializing the IEEE 1394 bus after plugging a  
30 translator in the IEEE 1394 bus;

(d) determining whether a request to transmit 1394 bus data exists;

(e) analyzing a packet header of packet data when a request to transmit data is received and checking whether the packet data is the data corresponding to the node  
5 connected to the translator;

(f) extracting a destination unit by analyzing the payload data;

10 (g) translating pure payload data removed of the unit information; and

(h) transmitting the translated payload data to the extracted destination unit.

15

4. The method of claim 3, wherein the step (a) comprises the steps of:

(a) setting a corresponding bit of the status register  
20 assigned to a port to which the analogue device is connected, when an analogue device is connected; and

(b) reading the bit status of the status register, identifying the connected analogue device with reference  
25 to a configuration ROM where connectable analogue devices are mapped to the port numbers, and recording a connection status.

5. An analogue translator substantially as hereinbefore  
30 described with reference to the accompanying drawings.

6. An analogue translating method substantially as hereinbefore described with reference to the accompanying drawings.



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Application No: GB 9923987.3  
Claims searched: 1-6

Examiner: Ms Ceri Witchard  
Date of search: 18 November 1999

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H3H (HE)

Int Cl (Ed.6): G06F (3/00 3/05 3/14 13/00 13/10 13/12 13/14)

Other: Online: wpi epodoc japio

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 5953511 (ODOM et al) See whole document	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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